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MEMORANDUM

TO : Mr. J. P.
FROM : Mr. C. F.

GENERAL BILL OF MATERIALS FOR THE
PROJECT

The following is a list of materials required for the
preparation of the project. The quantities are based on
the design of the project.

The quantities are based on the design of the project.

ITEM	QUANTITY	UNIT
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November 9, 1961

GERARD J. ARENSON
POLYCHEMICALS DEPARTMENT
RESEARCH & DEVELOPMENT DIVISION
EXPERIMENTAL STATION

TOXICITY OF TEFLON DISPERSING AGENTS

A brief summary of our toxicity work on AHT and other Teflon dispersing agents with emphasis on liver enlargement which seems to be the most sensitive sign of toxicity is given below. The detailed reports of work completed to date will be available within a few days.

AHT = (Ammonium 3,6-difluoro 2,5-di(tert-butyl undecafluorooxanoate)

The oral ALD for rats was found to be 50 mg/kg. Survivors showed definite liver enlargement in doses down to 1.5 mg/kg and with possible changes at 0.45 and 0.15 mg/kg. Single doses of 12 mg/kg produced liver enlargement which tended to increase during the two months following the dose. One one-hundredth of the lethal dose or 0.6 mg/kg given daily 5 times a week for 2 weeks produced enlargement which was significant in those rats killed on the day of final treatment and in those killed 14 days later. Histological examination of the livers indicated that the enlargement was due to increase in cell size rather than an increase in the number of cells.

The lethal dose by skin absorption in rabbits was 130 mg/kg. Although the changes in liver weight in these rabbits are more difficult to evaluate, there was a tendency toward enlargement and similar signs of liver injury.

A 25% aqueous solution in contact with the eye caused damage which penetrated through 3 days. Washing with water 20 times after application prevented permanent damage. Ten and twenty-five percent solutions were also irritating to guinea pig skin but did not cause skin ulceration.

Cp-ATC = (Ammonium perfluorooctylate)

The oral ALD for rats was 670 mg/kg. Liver enlargement was described down to a dose of 200 mg/kg with possible early signs down to 1.5 mg/kg.

BAZ

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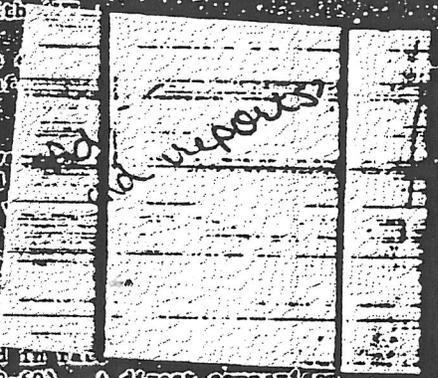
C₉F₁₉Br - (Ammonium 4-hydroxyhexa decafluorononanoate)

The oral LD₅₀ was 1500 mg/kg. Survivors showed enlargement which appears evident in doses as low as 12 mg/kg.

"Teflon" Feeding Tests with "Teflon" 7, "Teflon" 6 made with C₉-AFC, "Teflon" 6 made with C₉ and "Teflon" 6C made with

The compounds were fed at a level of 25% in the diet for 2, 3 and 5 weeks at various intervals.

Livers of rats sacrificed after two and three weeks showed slight enlargement only in the group fed "Teflon" 6C with AFC and "Teflon" 6C with C₉-AFC. The values of those fed "Teflon" 6C with C₉-AFC were significantly different from the controls and the others. Although the number of rats was small and the time of feeding relatively short, the results confirm the earlier liver enlargement observed in rats fed this compound in the diet for 90 days (H. Report No. 49-60). A direct comparison among these compounds is difficult to make in these feeding tests because we do not know the concentrations of the fluoro acid dispersing agents present.



Conclusions:

AFC is a very toxic compound. Not only does it have a low lethal dose but a single dose of 1/5 the lethal dose produced liver enlargement which increased with time. And 1/100 of the lethal dose fed 10 times produced definite liver enlargement. In addition, it was easily absorbed through the skin and produced liver damage in a second species. When "Teflon" containing less than 5 ppm AFC was fed to rats, it still produced enlargement which was apparent after 2 weeks.

The C₉ and C₉ materials have much lower acute toxicity, but they too have the ability to increase the size of the liver of rats at low doses. These short experiments may indicate differences in rate of development rather than qualitative differences but completion of microscopic examination of animals in the current study as well as dosing of greater numbers of rats at the indicated levels and holding them for longer periods would be needed to establish the lowest critical level for each compound.

It is recommended that all of these materials, especially AFC, be handled with extreme care. Contact with the skin should be strictly avoided. Tests on a third species, e.g. dogs, should be carried out where changes in liver function could be studied over a long period of time. The results of such tests might also throw some light on any possible species differences in susceptibility.

ME:rah

DOCTOR A. HOD
CHIEF, TOXICOLOGY BRANCH

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USEPA 16150

Toxicity Behavior of Fluorocarbon Surfactants - Garrison

Recent data obtained from Haskell Lab (via G. J. Anderson) indicate that the toxicity of AHD (the ammonium salt of HFFC trimer acid) is very low (ca. half that of sodium chloride). We also know that AHD is a poor surfactant. These data indicate a possible relationship between toxicity and surface activity. A tabulation of available data follows:

<u>Agent</u>	<u>CMC (%)</u>	<u>Surface Tension of a 0.2% Aqueous Solution</u>	<u>AD50</u>
AFC ₃	0.27	23	66
AHT	0.42	31	50
C ₉ APFC	1.1	46	670
C ₆ AFC	1.5	54	1500
AHD	7	61	7500
H ₂ O	-	72	-

*AFC₃ = NH₄ salt of TFD trimer acid
 **AD50 values probably ± 50%

The CMC (critical micelle concentration) and surface tension data are indicative of surface activity. These data suggest that:

1. AHT (NH₄ salt of TFD trimer acid), which is a slightly poorer surfactant than C₆AFC, should be of lower toxicity than AHD. Semivivo trials have shown that AHT may be used as a dispersing agent.
2. The telomer acid salts higher than C₉ might possess toxicity on the order of that of AHT.
3. Fluorocarbon surfactants as a class may possess a high degree of toxicity corresponding to their surface activity.

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TOXICITY DATA

SUBSTANCE: DIBENZYL HYDROPEROXIDE
(via S.O. PENDERSON)

<u>ANIMAL</u>	<u>MANNER OF ADMINISTRATION</u>	<u>ROUTE</u>	<u>CONC.</u>	<u>DOSE</u>	<u>RESULTS</u>
RAT	INGESTION	AL	1000	3000	LD50
RABBIT	25% SOLN ON SKIN				LD50
RAT	INGESTION	C-8	3000	12000	LD50
RAT	INGESTION	C-9	3000	12000	LD50

2. LIVER ENLARGEMENT

FINE POWDER: Up to 100 ppm of DHT on resin - no effect.

DISPERSION: Splashing - Be reasonably careful to wash affected skin areas within a few hours after contact. Extreme precautions not required.

FURTHER TOXICITY DATA

RABBIT	10% SOLN IN EYE	NO IRRITATION	=	NO EFFECT
	25% SOLN IN EYE	NO IRRITATION	=	NO EFFECT
GUINEA PIG	10% SOLN ON SKIN		=	NO EFFECT
	15% SOLN ON SKIN		=	NO EFFECT
	25% SOLN ON SKIN		=	NO EFFECT

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USEPA 16152

HLAB00023

CARRIER

CONC. AHT. SOLN

0.45

AQ. CHARGE TO P.K.

1140

5100

50% DISPERSION

WATER

2100

2100

12% DISPERSION

WATER

2100

2100

EFFLUENT FLOTATION TANK

2100

10500

EFFLUENT DRYER

1500

61000

BASIS

GRAMS CARRIER

Dose (lb/day) 110

THIN TNS CARRIER

QUESTIONS

(1) WWA

(2) CAN (85)

(3) COA

(4) RES

(5) ETC

(6) ...

(7) ...

(8) ...

(9) ...

(10) ...

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USEPA 16153

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ACUTE ORAL TOXICITY TEST

DATE: 10/28/68

MATERIAL: *Ammonium Perchlorate*

MR. 64 DEPT.

BR. NO.

DEPTH SAMPLE NO. 7-2-44

HASK NO.

DENSITY

Solid () Solution () gms/100 ml ()
 Liquid () Paste () gms/100 gms ()
 Semi-Liquid () Powder () ml/100 ml ()

Material given by stomach tube

Form or as a % solution of suspension

Date	Animal Number	Init Wt.	Dose (ml)	Dose (mg/kg)	% Sol	Weight Change (grams)	Results	WTG
9-28	48405	3731	2.80	250	10		Yes	Yes
10-3	48456	425	3.17	1500			No	No
9-28	48390	5988	4.33	1000	50		Yes	Yes
10-3	48453	430	3.88	670	10		Yes	Yes
10-3	48433	495	4.9	580	10		Yes	Yes
10-3	48476	4707	4.7	300	10		Yes	Yes
10-3	48450	5122	4.8	200	10		Yes	Yes
9-28	48345	478	4.7	250	10		Yes	Yes
10-10	48395							
10-10	48413	5508	5.5	150	10		Yes	Yes
10-10	48486	535	5.3	150	10		Yes	Yes

AVD: 1.0 mg/kg

REMARKS:

Grams per 100 ml

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USEPA 16155

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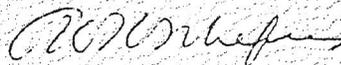
USEPA 16156

AMMONIUM PERFLUOROCAPRYLATE
(C₈APFC)

NR-604 - H-2005 - P-62-172

SUMMARY

Oral administration of C₈APFC, in three experiments involving forty-one rats, proved lethal in high dose concentrations through injury to the stomach, intestine, brain, lung and pancreas. At lower dose concentrations the chemical induced enlargement of the liver, pancreas and kidney, the least dose which induced a change in the liver being 1.5 mg/kg.



G. W. H. Schepers, M.D.
Pathologist

GWHS/ah
2-14-62

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